

WHAT IS CLAIMED IS:

1. A connector system for sterile connection comprising:
 - a male type connector including a tube connecting portion at a rear end portion thereof;
 - 5 a protective cap having a substantially cylindrical shape with a closed first end and being capable of connecting and disconnecting with/from a front end side of the patient side connector;
 - an inner cap including a ring-shaped portion that supports a disinfectant-impregnated member therein, the inner cap being retained
 - 10 inside the protective cap in an initial state; and
 - a female type connector having a double-cylinder structure in which an inner cylinder is fixed at one end portion of an outer cylinder, the inner cylinder including an internal end portion located inside the outer cylinder and an external end portion exposed outside the outer cylinder and capable
 - 15 of connecting with a tube,
 - wherein a channel for solution is connected by fitting the outer cylinder of the female type connector with the male type connector,
 - when the protective cap is fitted with the male type connector, the inner cap assumes a state of being retained at the front end side of the male
 - 20 type connector,
 - when the protective cap is removed from the male type connector, the inner cap is detached from the protective cap because of a retaining force at the front end side of the male type connector,
 - when the patient side connector with the inner cap retained at the
 - 25 front end thereof is connected with the female type connector, the internal end portion of the inner cylinder penetrates through the disinfectant-impregnated member in the inner cap, so that the channel is opened, and
 - when the connection between the male type connector and the
 - 30 female type connector is released, the inner cap is retained inside the female type connector and is detached from the front end of the male type connector.
2. The connector system for sterile connection according to claim 1,
 - 35 wherein the male type connector comprises a septum member at a front end portion thereof for protecting the channel, and
 - when the patient side connector with the inner cap retained at the

front end thereof is connected with the female type connector, the internal end portion of the inner cylinder penetrates through the disinfectant-impregnated member in the inner cap and the septum member of the male type connector, so that the channel is opened.

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3. The connector system for sterile connection according to claim 1, wherein the inner cap comprises a plurality of engaging legs extending from an outer edge portion of the ring-shaped portion in a direction along an axis of the ring, an engaging convexity is formed at a front end of each of the engaging legs so as to protrude inward, engaging concavities are formed on an outer surface of the front end portion of the patient side connector so as to allow engagement with the engaging convexities formed at the engaging legs of the inner cap, an inner cap retaining portion is formed on an inner wall inside the protective cap, where a retaining force exerted by the engagement between the engaging convexity of the inner cap and the engaging concavity of the male type connector is larger than a force exerted by the inner cap retaining portion of the protective cap to retain the inner cap,
- when the protective cap with the inner cap retained therein is fitted with the male type connector, the engaging convexities of the inner cap engage with the engaging concavities of the male type connector, and
- when the protective cap is removed from the male type connector, the retaining of the inner cap by the inner cap retaining portion of the protective cap is released due to the retaining of the inner cap at the engaging concavities of the male type connector, so that the inner cap is detached from the protective cap while being fitted with the front end of the male type connector.

4. The connector system for sterile connection according to claim 3, wherein on the outer surface of the male type connector, a circumferential step portion extending in a circumferential direction is formed so that a diameter at the front end side of the male type connector is smaller than that at a base end side, and a guide groove is formed so as to extend from the circumferential step portion toward the base end, the guide groove including an inclined portion that is inclined with respect to an axis of the male type connector,
- on the inner wall close to an opening end portion of the protective

cap, a guide protrusion is formed, and on the inner wall and extending toward the closed end side of the protective cap, a rotation blocking step portion is formed, the rotation blocking step portion being capable of contacting with the engaging legs of the inner cap so as to block a rotational action of the inner cap,

5 when the male type connector is inserted into an opening of the protective cap with the guide protrusion of the protective cap facing the guide groove of the male type connector, and then the protective cap and the male type connector are rotated while being urged axially toward each other,
10 the guide protrusion slides along the guide groove, so that the male type connector is pulled into an inside of the protective cap by a driving force resulting from a screw action by the inclined portion of the guide groove, and the engaging convexities of the inner cap, whose rotation is blocked by the rotation blocking step portion, engage with the engaging concavities of
15 the male type connector.

5. The connector system for sterile connection according to claim 4, wherein the male type connector comprises a blocking wall at the front end portion thereof, which is capable of contacting with a side face
20 portion of the engaging leg of the inner cap when the inner cap is fitted thereto, and the outer cylinder of the female type connector comprises: a guide protrusion formed on an inner wall close to an open end portion thereof, the guide protrusion being formed to correspond to the guide protrusion of the protective cap; a guide step portion including an inclined
25 portion that is inclined with respect to an axis of the female type connector; and an inner cap retaining portion formed at an inside of the connector and being capable of retaining the inner cap,

when the male type connector with the inner cap retained therein is inserted into the opening of the female type connector with the guide
30 protrusion of the outer cylinder facing the guide groove of the male type connector, and then the female type connector and the male type connector are rotated while being urged axially toward each other, the guide protrusion slides along the guide groove, so that the male type connector is pulled into the inside of the female type connector by a driving force
35 resulting from a screw action by the inclined portion of the guide groove, and at the same time the front ends of the engaging legs of the inner cap slide along the inclined portion of the guide step portion of the female type

connector while rotation of the inner cap is blocked by the blocking wall of the male type connector, so that a force in the axis direction acts on the inner cap so as to separate the inner cap from the male type connector, resulting in release of the engagement between the inner cap and the male
5 type connector, and the inner cap assumes a state of being retained by the inner cap retaining portion of the outer cylinder.

6. The connector system for sterile connection according to claim 5,
wherein the inner cap retaining portion of the female type connector
10 is configured with a horizontal step portion provided at the innermost of the guide step portion, and
when the front ends of the engaging legs of the inner cap contact with the horizontal step portion, the inner cap is prevented from moving in the axis direction toward the opening of the outer cylinder so as to be
15 retained in the female type connector.

7. The connector system for sterile connection according to claim 5,
wherein the inner cap retaining portion of the female type connector is configured by setting dimensions of constituting elements so that at least
20 portions of the inner wall of the inside of the outer cylinder contact with an outer circumferential surface of the ring-shaped portion of the inner cap or so that at least portions of the outer wall of the internal end portion of the inner cylinder contact with an inner circumferential surface of the ring-shaped portion of the inner cap, whereby the inner cap is retained by
25 the thus generated frictional force.

8. The connector system for sterile connection according to claim 3,
wherein the inner cap retaining portion of the protective cap is configured with a convex stripe formed on the inner wall of the inside of the
30 protective cap, and
the convex stripe contacts with an outer circumferential surface of the ring-shaped portion of the inner cap, so that the inner cap is retained by the thus generated frictional force.

35 9. The connector system for sterile connection according to claim 4,
wherein on the outer surface of the front end portion of the male type connector, a convex stripe is formed so as to extend in the axis direction

to a portion close to a joining portion between the guide groove and the circumferential direction step portion, and

when the protective cap or the female type connector is combined with the male type connector, the convex stripe guides the guide protrusion of each of the protective cap and the female type connector to the guide groove.

10. The female type connector used in the connector system for sterile connection according to claim 1, comprising a double-cylinder structure in which an inner cylinder is fixed at one end portion of an outer cylinder, the inner cylinder including an internal end portion located inside the outer cylinder and an external end portion exposed outside the outer cylinder.

11. The protective cap assembled member used in the connector system for sterile connection according to claim 3, comprising:

the protective cap having a substantially cylindrical shape whose one end is closed; and

the inner cap retained at an inside of the protective cap and including a ring-shaped portion with a disinfectant-impregnated member supported therein,

wherein on an inner wall of the inside of the protective cap, an inner cap retaining portion for retaining the inner cap is formed,

the inner cap includes a plurality of engaging legs extending from an outer edge portion of the ring-shaped portion in a direction along an axis of the ring, and an engaging convexity is formed at each of the engaging legs so as to protrude inward, and

the inner cap is retained in the inner cap retaining portion so that the front ends of the engaging legs are directed toward an opening of the protective cap.

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12. The male type connector used in the connector system for sterile connection according to claim 3, comprising engaging concavities formed on an outer surface of the front end portion thereof so as to allow engagement with the engaging convexities formed at the engaging legs of the inner cap.

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